REMARKS

Claims 1 and 11 have been amended to recite that the normalization parameters of the verification unit are "*means and standard deviations of the feature vectors corresponding to the verification unit in training data,*" and that "*these parameters are calculated in advance of runtime.*" These amendments are supported by, for example, the statement in lines 1-3 on page 8 of the original specification that: "*The normalization parameters of the verification unit are the means and standard deviations of feature vectors through calculating feature vectors corresponding to the verification unit from training data in advance.*" **In addition, it is respectfully noted that the amendments correspond to the suggestion made by the Examiner in the last sentence in item 1 on page 2 of the Official Action**.

Reconsideration of this application is respectfully requested in view of the following remarks.

Response to Rejections Under 35 U.S.C. § 103

Claims 1-2, 8-12, and 18-20 have been rejected under 35 U.S.C. § 103(a) as being unpatentable by Sukkar (US 6292778) in view of Laurila et al. (US 6772117). IN addition, claims 3-7 and 13-17 have been rejected under 35 U.S.C. § 103(a) as being unpatentable by Sukkar (US 6292778) in view of Laurila et al. (US 6772117) and further in view of Carey et al. (US 5526465).

The rejection of claim 1, which is based on Laurila's teachings of normalization and Sukkar's teaching of a verification score, is respectfully traversed on the grounds that the normalization of the invention is

different from that of Laurila, and the verification score is different from that of Sukkar, as follows:

- Laurila teaches normalization by **dynamically calculating** means and standard deviations **during runtime** rather than using normalization parameters that were ***pre-obtained from training data before runtime***; and

- The verification score of Sukkar is a **likelihood score ratio** of the sound associated with the subword hypothesis and the speech segment consisting of a different sound, rather than being obtained by ***inputting the normalized feature vectors*** to the verification-unit corresponded classifier, as claimed.

Laurila discloses a normalization to compensate the effects of noise (col. 2, lines 12-16) for improving speech recognition, but the normalization is carried out by sliding the mean values and standard deviations of a normalization buffer (col. 2, lines 16-21; Fig. 5). That is, the mean values and standard deviations used are dynamically calculated and obtained during runtime (col. 4, lines 6-43; Fig. 4). In contrast, the normalization in the invention uses the normalization parameters, which are pre-obtained and pre-stored in the database, of the verification unit corresponding to the speech segment for adjusting the dynamic range of feature vectors (page 7, line 10-page 8, line 7). The claimed normalization is therefore not analogous to that of Laurila, which is used to compensate the effects of noise and improve speech recognition rather than to adjust the dynamic range of feature vectors as in the present invention.

Further, the verification scores disclosed by Sukkar are determined as a ratio of the likelihood that the speech segment contains the sound associated with the subword

hypothesis to the likelihood that the speech segment consists of a different sound (col. 10, line 66 to col. 11, line 3). In other words, the verification score is a likelihood score ratio of the sound associated with the subword hypothesis and the speech segment consisting of a different sound. In contrast, the verification score in the invention is obtained by inputting the normalized feature vectors to the verification-unit corresponded classifier.

Consequently, it can be seen that the normalization in the invention is different from that of Laurila, and the verification score is different from that of Sukkar, and therefore withdrawal of the rejection of claim 1 based on the proposed combination of the Laurila and Sukkar patents is respectfully requested.

The rejection of claims 2 and 12 is also respectfully traversed on the grounds that the means and standard deviations used to normalize the feature vectors in the claimed invention are pre-obtained and stored, whereas the adjusting parameters disclosed by Laurila are carried out by sliding the mean values and standard deviations of the normalization buffer, *i.e.*, they are dynamically calculated and obtained during runtime. Moreover, the normalization of the invention uses the normalization parameters, which are obtained and stored in the database before runtime, of the verification unit corresponding to the speech segment for adjusting the dynamic range of feature vectors rather than for noise compensation. As a result, the means and standard deviations are applied differently in the invention and Laurila.

With regard to claims 9-10 and 19-20, the training data used for training the MLPs in the invention are pre-corrupted by noise with different power levels of SNR (for example, the speech segments corrupted by in-car noise with

SNRs of 9dB, 3dB, 0dB, -3dB, and -9dB are used to train the MLPs; see page 11, lines 9-17). In contrast, only a certain amount of noise is given in training by Sukkar, which is different from the present invention and results in inferior performance relative to the MLP training provided by the invention. Similarly, Laurila discloses a method for compensating the effects of noise and increasing the effect of speech recognition, which compares the method with the other methods at 5, 0, -5, -10 dB SNR (col. 6, lines 6-37), and which therefore is different from the invention which does not compare with the other methods but directly experiences the telephone speech at the different SNRs. In order to realize the advantage of the present invention, one can use a known method (Sukkas, R.A., "Subword-based Minimum Verification Error (SB-MVE) Training for Task Independent Utterance Verification" Proc. ICASSP'98, 1998) and the present invention to receive noise-corrupted speech signal for implementing verification to see the difference therebetween. The result can be seen in the supplementary document "MLP-BASD UTTERANCE VERIFICATION FOR IN-CAR SPEECH RECOGNITION." Briefly, the invention can provide good speech recognition when the environment is changed, especially in a heavy noise environment.

Accordingly, the invention recited in claims 1-2, 8-12 and 18-20 is different from and patentable over the methods described in Sukkar and Laurila, whether considered individually or in any reasonable combination.

Furthermore, in contrast to the **Carey patent**, the invention uses an MLP neural network as the classifier for changing the normalized feature vectors into the verification score, not for increasing discrimination between the personal model and the world model, as described in col. 11, lines 15-20 of Carey. In addition, Carey uses a Baum-Welch backword pass algorithm and the

likelihood information in MLP training in order to increase discrimination between the personal model and the world model, whereas the invention uses an error back-propagation algorithm and information on sequences of verification feature vectors in MLP training in order to generate the verification scores. Moreover, Carey requires two values Pp and Pw for speaker utterance training (col. 11, line 60 to col. 12, line 7), whereas the invention only uses the target value for speech segment training.

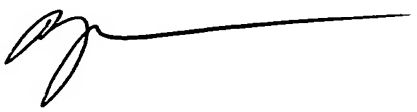
Accordingly, dependent claims 3-7 and 13-17 are different from and patentable over the Carey, Laurila and Sukkar patens, whether considered individually or in any reasonable combination.

CONCLUSION

In view of the foregoing remarks, reconsideration and allowance of the application are now believed to be in order, and such action is hereby solicited. If any points remain in issue that the Examiner feels may be best resolved through a personal or telephone interview, the Examiner is kindly requested to contact the undersigned attorney at the telephone number listed below.

Respectfully submitted,

BACON & THOMAS, PLLC



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